#### R E P O R T R E S U M E S

ED 010 853 24

RELATIONSHIPS BETWEEN LEARNING AND SEMANTIC AND FORMAL SIMILARITY.

BY- BOHM, AUDREY M.

FRANCISCO

SAN FRANCISCO STATE COLL., CALIF.

EDRS PRICE MF-\$0.09 HC-\$1.16

REPORT NUMBER CRP-S-241

PUB DATE

29F.

66

DESCRIPTORS- LEARNING PROCESSES, SEMANTICS, VERBAL ABILITY, \*ASSOCIATIVE LEARNING, \*WORD RECOGNITION, \*READING INSTRUCTION, \*PAIRED ASSOCIATE LEARNING, \*LEARNING THEORIES, PERCEPTION, PATTERNED RESPONSES, INSTRUCTIONAL MATERIALS, SAN

AN EXFERIMENT WAS DESIGNED TO TEST THE HYPOTHESIS THAT, WITH MATERIAL OF HIGH MEANINGFULNESS, THE SEMANTIC DIMENSION OF SYNONYMITY (BATTLE-FIGHT) WILL HAVE GREATER IMPACT ON THE LEARNING FROCESS THAN THE DIMENSION OF FORMAL SIMILARITY (BATTLE-BOTTLE). THE LEARNING MATERIALS CONSISTED OF FOUR LISTS OF 12 FAIRS OF TWO-SYLLABLE WORDS. THEY WERE PRESENTED TO 12D SUBJECTS FROM INTRODUCTORY PSYCHOLOGY COURSES WHO WERE UNFAMILIAR WITH FAIRED-ASSOCIATE VERBAL LEARNING, AND THE EFFORT OF THE FAIR RELATIONSHIPS ON LEARNING WAS ANALYZED. THE MOST IMPORTANT FINDING WAS THE CONSISTENT FACILITATING EFFECT OF THE FORMAL RELATIONSHIP FOR BOTH FAMILIAR AND UNFAMILIAR MATERIALS. WITHIN THE CONTEXT OF THE CLASSROOM, THE FINDINGS INDICATED THAT CERTAIN LEARNING MATERIALS MIGHT BE LEARNED MORE EASILY IF A FORMAL RATHER THAN A MEANINGFUL RELATIONSHIP IS UTILIZED. (GD)

Relationships Between Leving and

Big Paul Late of Book To Charles - Paul Control Late Control - Section 1982 - Paul Control - 1982 -

Semantic and Formal Similarity

Cooperative Research Project No. S-241

Bohm

San Francisco State College

U.S. DEPARTMENT OF HEALTH, EDUCATION AND WELFARE
Office of Education
This document has been reproduced exactly as received from the
person or organization organization of ginating it. Points of view or opinions
stated do not necessarily represent official Office of Education
position or policy.

等時間 按 计影响器

#### TITLE

Relationships Between Learning and Semantic and Formal Similarity

Cooperative Research Small Contract Project S-241

概念的智慧等 医乳腺 网络克拉斯克特 工具

**建筑机工建筑**重

310481 -

1. Sec. 15

#### Author

Audrey M. Bohm
Associate Professor of Psychology
San Francisco State College
1600 Holloway Avenue
San Francisco, California 94132

Year

June 1, 1965 to May 31, 1966

3 2 2 2 2 2 2

The research reported herein was supported by the Cooperative Research Program of the Office of Education, und Welfare

	TABLE OF CONTENTS	44345
	t seekkenstern Progress & South Livery Town Mileson (1941), Consess.	ۇرو <sup>ق</sup> ۇ
	Pa	ge
	PROBLEM	1
	RELATED RESEARCH AND RATIONALE	2
	Total of the second the second	ы. <b>5</b>
,	Viscoi paying some come companies and make the transfer in the companies of the companies o	6
	Materials	б
	Désign	8
	Method	8
	Subjects	8
	RESULTS	0
	DISCUSSION	4
	BÎBLÎJGRAFRY	19
	APPENDIX	21
	The state of the s	
	Illustrations	
	MODELLA SERVERA ARTICLA SERVERAL CENTRAL SERVERAL CONTROL TO A TO	•
	The state of the s	,2
	TABLE SE LEADER SERVICE SERVICE CONTRACTOR OF THE SERVICE OF THE S	,
ij	in the direction <b>Table. 1</b> Spin-1800 The Table 1800 is 1800 to	<b>.8</b>
	and the manage and proper and the test of the part of the part of	6
,,,	Table 1-1	3
4	Control of the second of the s	=-
	having alternations of the land to the second of the secon	

ERIC

PROBLEM TO THE THE LOCAL STREET WILL BELLE IN GROOM THE STREET

The importance of similarity as a variable influencing the learning process has been well established in the laboratory by many different investigators (Bugelski & Cadwalkier, 1959; Gibson, 1941; Osgood, 1949). Similarity of the materials has been shown to affect rate of original learning, amount and direction of transfer as well as the degree of interference or retention. Many recent textbooks in the field of educational psychology make recommendations concerning teaching techniques on the basis of these findings, (Frandsen, 1961; Smith and Hudgins, 1964; Travers, 1963; Thompson, Gardner, and Divesto, 1959).

Meaningfulness has been equally well established as an important variable influencing the learning process. The effect of increases in meaningfulness on the acquisition process has been demonstrated in numerous experiments which have used a variety of different indices of the concept. These indices include such measures as the percentage of subjects having associations (McGeogh, 1930), the number of associations given to a particular word (Noble, 1952), frequency of occurrence in the language, familiarity, and pronounceability (Underwood and Schulz, 1960). Again many recent texts in the field of educational psychology contain sections which are concerned with the influence of meaningfulness on Tearning and which suggest that teaching techniques be modified in the direction of the experimental findings. (Franceen, 1961; McDonald, 1959; Savry and Telford, 1958; Travers, 1963).

The purpose of the study presented here is to investigate the relationship between the degree of meaningfulness of the materials and the particular dimensions of similarity which have been traditionally

tika i karing nga katakan matakan ari ng palikalah ana ari tanggan danggan bang

investigated in the laboratory. Most of these investigations have defined similarity in one of two vays, either in terms of the formal properties of the materials or situations or in terms of semantic properties. The former definition emphasizes the number of shared or repeated elements between two items, e.g., bettle-bottle, while the letter emphasizes the sementic dimension of synonymity, e.g., bettlefight. In the past investigators have proceeded as if these were mutually exclusive instead of overlapping categories. With nonsense material where the cognitive aspects of the material are minimal there is little probability of confounding the effects of semantic and formal similarity. However, with meaningful material, such as the verbal materials used in classroom instruction, the possibility of a confounding effect is much greater. Specifically, this experiment is designed to test the hypotheses that with material of high meaningfulness the semantic dimension of synonymity will have a greater impact on the learning process than the dimension of formal similarity. Conversely, with material of low meaningfulness, it is expected that the formal disension will have a greater effect than the semantic.

#### RELATED RESEARCH AND RATIONALE

The rationale for the above hypotheses is derived from an associative theory of learning. Such a theory views the learning of verbal material as subject to the influence of prior associative experiences.

In the laboratory setting these earlier experiences have been designated as pre-experimental habits (Underwood & Postman, 1960). Depending on the specific learning situation (paradigm) involved, these pre-experimental habits have been shown to act positively to facilitate the learning of new material, negatively as interfering competitors

produce both facilitation and interferences (Pestman, 1962, 1963). The theory also assumes that as the familiarity of the materials increases so too does the number of these pre-experimental habits. It therefore follows that unfamiliar materials should be less influenced by pre-experimental habits while familiar material should be more influenced.

The present experiment stresses an additional assumption that the effects of pre-experimental habits do not occur at random but rather that they are mediated by categories. This assumption emphasizes the point that interference and/or facilitation occurs along certain specific dimensions.

One of the most important and well investigated dimensions along which these effects occur is similarity of the materials. Numerous experiments have investigated similarity as a parameter in both learning and retention. When these investigations have dealt with nonsense material the traditional definition of similarity has been in terms of the number of identical elements or repeated letters. When meaningful words have provided the material for the experiments similarity has usually been manipulated in terms of the semantic properties of a word. Thus, the concept of similarity has been explored by investigators using two different definitions neither of which excludes the other. The definition in terms of identical elements is essentially a formal one based on the physical characteristics of the material. The semantic definition might be termed a cognitive definition since it is based on the meaningful properties of the items. That should be noted is the fact that these definitions are not mutually exclusive. Objects of

of verbal materials. The most meaningful word is composed of the formal properties of its letters while even the least meaningful nonsense syllable may elicit some kind of meaningful association. To date there has been no direct attempt to evaluate separately the effects of these two dimensions of similarity.

Certain evidence suggested that each of these dimensions may influence the learning and retention of verbal materials to a different degree depending on the frequency of the words. When both high and low frequency words were given as stimuli in an association test many more formal responses were given to the low words than to the high words (Postman, in press). While conducting a series of experiments at the University of California at Berkeley under the direction of Leo Postman, the author noted that different aspects or properties of the material were selected and utilized by subjects learning and remembering low frequency material than were selected by subjects who were dealing with high frequency items. During the free recall of low frequency words subjects tended to alphabetize and group together physically similar words. During the free recall of high frequency words the items tended to be grouped in meaningful sequences with little attention to their formal properties. These observations suggested that when the familiarity of the items is low and the exact cognitive meaning of many of the words may be unknown to many subjects, the formal properties of the meterial would be emphasized. With familiar naterials knowledge of the cognitive meaning of the items is more probable and within this richer associative context the importance of the formal properties of the items should diminish.

#### HYPOTHESES

The present experiment was designed to test the hypotheses that

for unfamiliar stimulus words formally related responses could be

learned more readily than semantically related responses. With fami-

lier stimulus words the semantic relationship was expected to be more

effective than the formal.

185 at the a variety from 181 to 1966. In account and of 1. Company view11 (12) have a sense frequency of a company from 2 of 50 has maked as a company of a company of a company from 2 of 50 has maked as a company of a compa

Time og goder fill de timmet het his het bet det det entenfektion in time om fill ogsådes det for natural for a lit of the 150 in land to have he attacked ్రశాజులో ఉంది. నక్కుం ఉద్దేశాలలో మార్డు ముంది దేశాల కార్యాలు an the properties with which with the first of the second with Parties and the medical and the contraction of the motorium articula com résponden en Signian de la come en partir en 1997 à la come there extend of (3) relationary to the ar coins of it will be ARCHION, IRANGALANIO CONTRAL GRAN CONTRALA CONTRALA CONTRALA was established by acting the appropriation of the best of the Minimum Tens the the the makes word for recognizated accurace the feel accuracy. The fi beloder, 1962, Tomalo, 1944.) The vent perturbation of survey staticzediscretization retirmed and appropriate communication and the first of the contraction of III for III mater. Two the in privation are seen constructed before distributed, 1966) was E.M. I'm [E] pulse and T.O. See [G] seems. the transfer and action and the first party are

PROCEDURE(A) pains.

Material.

The learning materials consisted of four lists of twelve pairs of two syllable words. Two sets of twelve stimulus words were chosen from the association norms of Postmen (in press). One set of high frequency (Thorndike and Lorge, TL, 1944) stimuli (HS) had a mean frequency of 489 with a range from 151 to 1564. A second set of low frequency stimuli (IS) had a mean frequency of 14 with a range from 1 to 32. The choice of specific stimuli was based on the occurrence of appropriate response terms in the nouns.

Two types of response terms were selected from the association nouns for eight of the HS and eight of the LS stimuli. One set of responses was selected on the basis of their formal (F) similarity to the stimuli. Formal similarity was defined as the percentage of letters in the response word also occuring in the stimulus word, e.g., Trouble-Turtle 100%, Bramble-Gamble 84%. The mean percent of formal similarity between stimuli and responses was 85% for the HS pairs and 73% for the LS pairs. The second set of responses was selected on the basis of their semantic (S) relationship to the stimulus word, e.g., Trouble-Anguish, Bramble-Thistle. The existence of a semantic relationship was established by noting the occurence of the response word as a synonym for the stimulus word in recognized sources (e.g., Roget, 1962; Webster, 1942, Fernald, 1947.) The mean percentage of formal similarity between stimuli and sementic responses was 27% for HS pairs and 18% for Is pairs. For the HS pairs the mean association value (Postman, 1966) was 2.50 for (F) pairs and 1.63 for (S) pairs. For the IS pairs the mean association value was 3.25 for (F) pairs and

.2.75 for (S) pairs : 3 - 00

The four remaining stimulus words within each frequency were paired with unrelated words (I), i.e., words which aid not occur as associates or as synonyme and which had minimal formal similarity, e.g., Window-Human, Fetish-Quarter. The mean percentage of formal similarity was 25% for HS pairs and 28% for LS pairs. The unrelated pairs were included to minimize the effect of a specific response set to give either synonyms or formal responses or more general set to give associations.

Two different lists, A & B, were constructed for each HS and IS frequency, each list containing four F pairs, four S pairs and four U pairs. For a given stimulus frequency the stimuli were the same in each list while the response terms for F or S pairs were either one or the other, i.e., the formal or the semantic response. For the U pairs the responses in each list were different unrelated words. The TL frequency of all responses was balanced between lists and among pair relationships so that an equal number of high and low responses appeared in each condition. All high responses were TL count A or AA. Low responses ranged from 8 per 18 million to 19. A complete description of the lists can be found in the Appendix.

This selection and frequency control procedure exhausted the available pairs of words in the norms. It was therefore necessary to include some pairs in which the response terms also occured as associatives to stimuli other than the one to which they were paired. The occurence of all such inter-item associations was noted and will be incorporated in the discussion of the results.

para de vinciones de la companie de

mark Willer

#### Design.

the other half learned lists with low stimulus frequency. Paired relationships were manipulated within lists as were response frequencies. The design of the experiment is thus mixed with independent comparisons between stimulus frequencies and repeated measures among pair relationships and response frequencies. The design is summarized in the following table:

Table 1. Experimental Design

Pair	Response	STIMULUS	FREQUENCY
Relationship	Frequency	Hi S	Lo S
ភ	H	A see a least	
,	L		
S	Н		
	T.	-	
· ••	ъ <b>Н</b> з.		
U	L		

#### Method.

The lists were presented on a Stowe electronic memory drum at a 2:2 sec rate with an 8 sec intertrial interval. To minimize the effect of the serial learning of response terms instead of stimulus response pairs five different orders were constructed for each list. The orders were random with the restriction that no pair appeared more than once in the same serial position nor was any pair followed by another pair more than once. Each S continued learning the lists until a criterion of 12/12 was reached on a given trial.

#### Subjects.

There were 60 Ss in each group making a total of 120 in the experiment. Ss were volunteers from introductory psychology courses and were nedve to paired-associated verbal learning. Assignment to conditions was by the randomized black technique. Each S was paid \$1.25 for his

participation in the experiment. Eight pilot Ss were run to determine the general level of difficulty of the tests. A total of four S were rejected, 2 HS and 2 IS. Two were experimenter errors and two were failures to learn, 1 HS and 1 IS. The total number of S's involved in the research was thus 132.

In the original proposal it was expected that observations could also be made of transfer to a second list and of retroactive interference, i.e., the retention of the first list. In the process of constructing the lists it was discovered that these aims could not be accomplished because of the limited number of appropriate pairs of words available in the norms. A particular problem was the presence of interitem associations among the responses. A full discussion of this problem will be found in the results section. This problem was partially solved by having subjects learn a single list only; however, this វីសៅស្រាស់ទៅ ២១ ៥ ១០០ ១៣ ១០១០ solution precluded the learning of any further lists, and, consequently, any tests of transfer or retroaction. Since the main problem with which a from busher of by livering the the research was concerned was the effect of the pair relationships on . 最快 "她们不知道不 这就 是为了不必?" learning it was decided that it was appropriate to limit the study to នេះស្រីក្រស៊ីប្រេក ប្រែការស្រែកម្ពុជា ស្រែក ស្រែក ស្រែក ស្រែក ស្រែក ស្រែក the observation of original learning only. the line of the same of the entire

The formula form had the expensive the first section of the first sectio

急 シャキャー かんさん はんしゅん オー

部门 化二替二二甲二酚二甲二酚 "这样" 1967年,"梅宝

**RESULTS**AR CAMBAGA TO A TUTA COTENTATION IN CONTINUE OF A CAME USE

Within each stimulus condition at test was performed between the mean total number of correct responses on List A and List B.

For the HS group t = .76, p > .05 and for the LS group t = 1.13,

p > .05. Since neither t value approached significance both lists

were grouped for the first analysis.

The mean number of correct responses for lists A and B during learning for each condition is presented in Fig. 1 and in Appendix Table 1. Each value represents the mean of the sum of two pairs of items. Thus the value 17.5 for the point LS - HR - F is the mean of the sum of two such pairs. The mean value for any single pair at any point is simply the value at that point divided by two. It should be noted that in Fig. 1 slower learning between groups is indicated by a greater total number of correct responses in the slower group while slower learning within a group is indicated by a fewer number of correct responses in the slower condition.

An analysis of variance for a mixed design for fixed variables with one independent and two repeated measures was performed on the acores (Winer, 1962). The results of the analysis (Appendix A-1)) indicates that all main effects and interactions are significant beyond the 105 or 101 percent level.

The greater total number of correct responses made by the HS group as compared with the LS group, P = 5.29, p < .05, reflects the slower learning and greater difficulty of the LS material. The effect of response frequency is also significant, P = 18.67, p < .01, demonstrating the slower learning of LR responses within a list.

However, a significant interaction between stimulus and response

West designer of American Services

frequency suggests that this difference in learning is a function of the LS condition only.

The effect of pair relationships is highly significant, F = 134.54, p. .01. In all cases the F condition is superior to the S and U conditions. With the exception of the HS - HR condition the regative progression from F to S to U is consistent. At no point is semantic similarity superior to formal similarity. These results confirm the prediction for LS material but directly contradict the prediction for HS material.

The significant interactions between pair relationships and both stimulus frequency and response frequency as well as the significant triple interaction draw attention to the HS - HR condition. Here the F - S - R progression is disrupted and the S condition appears to be poorer than the U. An analysis of the errors made during learnings showed that this effect was mainly determined by the interference of two pairs of items in a single list. A check of the association norms also showed that the two pairs were related associatively. It therefore appears that the poorer performance on the semantic pairs in this group is a function of inter-item association in a single list, List B, and not a reflection of the interaction of manipulated variables in the experiment.

It was therefore decided to confine the remainder of the analysis to a single list for each condition, List A. This resulted in dropping the total N from 120 to 60. The selection of List A for the LS condition was made by chance and was decided upon prior to any examination of the separate lists in this condition other than the original t test.

#### Mean Number of Correct Responses

The same of the sa Continued and the continued of the contract of · 医性萎缩 声音说话,这句话说,这样 The Reservation of the second Alexande the effect of response that tweet he are a contract by Special Secret. 强性 的 新山區 医多种性 医二氏 化氯化甲甲甲酚 的复数电影 医乳腺 经自动的经济的 医多种性 经现代的 医生物 医二角性性炎 कि हर् और का बाल रेक देशका कि मिल्टी कि कि T 6 图 图 2 Fee and Expension village of the college of Ø. Res of medic for process or pons. the grown read to designations in The willian this value. Three the Cobeffe train 医感感 医水类 经银币 以高级 经济 b and 5 is sharefore accepted by statistical cy suspensed the relation that the first constitute has been stated as denote the first the state of t

the second secon

The results of this second analysis of Libt A data also appear in Fig. 1, and in the Appendix A-2 and Table 1. As use found in the first analysis the main effects of atimulus frequency and response frequency are both significant. For atimulus frequency F 6.73, p<.05, for response frequency F = 29.36, p<.01. The better learning of high frequency material is in line with other well established findings in this field. The interaction between atimulus and response frequency which limited the effect of response frequency to low stimuli is no longer significant. For both kinds of stimuli high frequency responses are learned better than low frequency responses.

The effect of pair relationship is again highly significant,

F = 54.99, p<.01 as are the interactions of pair relationship and

stimulus frequency, F = 12.47, p<.01 and response frequency,

F = 18.74, p<.01. The triple interaction is not significant. For low

frequency responses the effects of pair-relationship are quite consistent,

formal similarity is superior to semantic similarity while both are

superior to unrelated pairs. Scheffe tests on the differences between

subsets of means (Appendix A-3) indicated that for LS-LR conditions

F vs S and S vs U are both significant beyond the .01% level. For the

HS-LR group F vs S is significant at the .10 level while S vs U falls

below this value. Since the Scheffe test is a conservative one, it

has been recommended that an alpha of .10 is appropriate. The differences

between F and S is therefore accepted as significant in the HS-LR condi
tion.

With high frequency responses the effects of pair relationship vary with stimulus frequency. For the HS-HR condition there is no difference between S and U while F is significantly different from both at the .10 level. In the IS-HR condition there is no difference between F and S

while both are significantly different from U at the .01 level.

varying in terms of the difficulty of the material to be learned; from easy to hard in the fellowing progression, HS-HR, HS-IR, ES-IR, the effects of pair relationship may be summarized as follows. With very easy materials, HS-HR, semantic pairs are learned no better than unrelated pairs while formal pairs are learned better than both. As the material becomes slightly more difficult; HS-IR, the disadvantage of unrelatedness becomes more apparent? With an additional increase in difficulty, IS-HR, both formal and semantic relationships facilitate the learning of the material as compared with unrelatedness. In the most difficult condition, LS-IR, the formal relationship facilitates than the absence of a relationship.

ANAPORT SOLITONIA CONTRACTOR CONTRACTOR OF THE CARPORT OF THE CARPORT OF THE CARPORT OF THE CONTRACTOR OF THE CONTRACTOR

- en les frances de fonés en l'entre de l'entre de le compart de l'été de la little de l'été de
- The cheer are well are and with the country to b.
- The stands are conflict and responds are uniquities (U.S).
- ners of the popular and responses one both evidential (1-1). The

#### CONCLUSIONS AND IMPLICATIONS.

The single most important finding of the experiment is the consistent facilitating effect of the formal relationship for both familiar and unfamiliar meterials. In the original hypotheses this result was expected for the unfamiliar, low frequency pairs, but was not predicted for familiar pairs, where the semantic relationship was expected to be the more effective.

The significant effects of stimulus and response frequency may be attributed to a general facilitating effect due to the amount of past experience with the materials. Familiar words are better integrated items and more readily available to the subject than are unfamiliar words. Unfamiliar words are less recognizable and may even have to be integrated before they can be produced as learned items. Thus, the finding that high frequency stimulf and responses produce better learning than low frequency items is consistent with associative theory and other empirical findings in the area.

However, additional theoretical assumptions are required to explain the results concerning pair relationships. These results may be summarized as follows:

- 1) When stimuli and responses are both familiar, (H-H) there is no difference between semantic (S) and unrelated (U) pairs while formal (F) pairs are superior to both.
- 2) When stimuli are unfamiliar and responses are familiar (L-H), F and S are equal and both are superior to U.
- 3) When stimuli are familiar and responses are unfamiliar (H-L), F is better than S which is better than U.
- botter than S which is better than U. These results are presented

symbolically in Table 2. The relationship received and the sections in

It is felt that these results can best be explained by the introduction of the concept of mediation. This concept refer to an internal event which is assumed to occur and facilitate the learning of an S-R association. Underwood (1965) has suggested that two different types of mediators may occur. The first type is called a representation response (%) and consists of some internal representation of the stimulus itself. This type of mediator might also be described as perceptual. The second type of mediator is called an implicit associational response (i.a.r.) and involves the arousal of the meaningful or cognitive aspects of a stimulus. In the context of the present experiment it is suggested, that the introduction of a pair relationship is equivalent to activating a mediatores in the case of formal similarity the mediator is assimed to be all or perceptual type response; With the introduction of a sementic relationship it is assumed that the implicit associational response in a reproduction play. In the presence of familiar material the Wor the itarr. are equally effective as mediators. With unfamiliar material the absence of a rich associative context makes the 1.a. r. less effective than the M. No mediation is assumed to occur with unrelated pairs. Columns 3 and 4 in Table 2 summarize these assumptions. U paint. In the less grown the results of such to a

One final set of assumptions is needed to complete the explanation.

Since the 1.a.r. involves the associative properties of the word, it
will be argued that the activating of this mediator not only facilitates
the forming of an association, but also presents the opportunity for
interfering responses from the 1.a.r. complex to occur and impede learning.

Table 2. Summary of pair relationship results and their theoretical explanation.

seastwater of tax of the textury a popul	for to company of
Condition Result Mediator Wt. Inte	•
A HAR TO THE TOTAL STATE TO BE SEED .	0. 2008:3 % incress (2.5 )
in wites of explicer asking that the field main	_
L-H-S-SUS Star . Secret 2 col 4 m.s	0 0 · · · · · · · · · · · · · · · · · ·
The assuration of Material City Research of	
H-L FSS V Siar 2 crist in	0 2 1 1
discountly the Tinding, such it is applied	
L-L F>SSUSSIA	0 2 0 1
Withto the emission of the classes has in the	

This interfering potential is dependent on the presence of familiar stimuli and enhanced when both stimuli and responses are familiar.

In Table 2 this is represented by the minus values in column 5. A simple sum of the weighted mediator and amount of interference in the final column (6) describes the rank order of the pair relationship findings.

元於一位三國一時的實際有名。 磁磁温频器自分量 自動主命數 富有一块多数或多点多一点重要了多一点 "说话,你们是这样是这一

For the H-H group the advantage of S mediation is offset by a high degree of interference depressing performance on S pairs to the level of the U pairs. In the L-H group the absence of such interference leaves F and S equally effective. In the H-L condition the S effectiveness is modified by a moderate amount of interference. In the L-L condition the absence of interference is offset by the ineffectiveness of the semantic or iar mediator. These findings have implications for continuing research in both the laboratory and the classroom.

effectiveness of formal similarity as a mediator is suggested.

Mediation can be defined operationally in terms of an experimental design and the formal, semantic relationship should be investigated in terms of explicit rather than implied mediation, i.e., as an empirical fact rather than a theoretical construct.

The assumption of minimal interference for rr mediation might be substantiated by free association techniques.

Minimally the findings should be replicated with different materials and techniques to extend their generality.

Within the context of the classroom these findings are related to the general emphasis which is usually placed on "meaningful" relationships among materials to be learned. Since these results indicated a high degree of facilitation in learning with a formal relationship it is possible that certain learning materials might be learned more easily if a formal rather than a meaningful relationship was utilized, e.g., the BOY plays with a TOY instead of the BOY plays with a GIRL.

Another possible implication of the finding is that children with reading difficulties may be emphasizing formal properties and rejecting a move to the more difficult semantic aspects of the materials. The equal effectiveness of semantic and formal relationships in the LS-HR group suggests a possible way of correcting the "set" for formal properties if it exists.

If would also seem appropriate to investigate the developmental aspects of the phenomens. The early learning of nursery rhymes can

1430 -

of a preference for the formal relationships.

The phenomena may also be of value in suggesting ways of introducing new material in the curriculum. It is possible that a combination of meaningful with formal would prove most efficient

for certain kinds of material, e.g., BOY-TOY mather than BOY-GIRL.

33-1 B

in the second of the second of

The straight was the second of the second of

on a like timen, ilmet, i vien da von in error til och och in i til i viden i den sidelige er Liverik i i viden i viden i viden i viden i viden i siden i viden er

o de la companya de Cara a companya de la companya de esperante de la companya de la companya de la companya d Cara de la companya d

The Condition of the Co

The survey. The more extract, the more freeze and the second of the seco

AND BERT OF THE CONTRACTORS OF T

the Propher, I.C., September, W. . , and I thereby the Color Consideration of the Color Co

to. Grandier, P. L., and Longe. I., The Machine Stad Dath of F. 190 Target. (Tow-look, Barrier of Publications, Towellers 2011., Colonies with ., 1941).

#### BIBLIOGRAPHY

1. Bugelski, B.R. and Cadwallder, T.C., "A Reappraisal of the Transfer and Retmonotion Surface," J. Exp. Psychol., 1959, 52, 360-370.

Dr. Tress on Art with Editor Street Life of white the street

- 2. Fernald, James C., Funk and Wagnalls Standard Handbook of Synonyms, Antonyms, and Prepositions. (New York, Funk & Wagnalls, 1947).
- Frandsen, Arden N., Educational Psychology. (New York, McGraw-Hill Inc., 1951) p. 361.
- 4. Gibson, E.J., "Retroactive Inhibition as a Function of the Degree of Generalization between Tasks," J. Exp. Psychol., 1941, 28, 93-115.
- McDonald, Frederick J., <u>Educational Psychology</u>. (Belmont, Calif., Wadsworth Publishing Co., Inc., 1959).
- 6. McGeoch, J.A., "The Influence of Associative Value upon the Difficulty of Nonsense-Syllable Lists," J. Genet. Psychol., 1930, 37, 421-426.
- 7. Noble, C.E., "An Analysis of Meaning," <u>Psychol. Rev.</u>, 1952, A <u>59</u>, 421-430.
- 8. Osgood, C.E., "The Similarity Paradox in Human Learning," <u>Psychol</u>. Rev., 1949, <u>56</u>, 132-143.
- 9. Postman, Leo, "The Effects of Language Habits on the Acquisition and Retention of Verbal Associations," J. Exp. Psychol., 1962, 64, 7-19.
- 10. Postman, Leo, "Does Interference Theory Predict Too Much I rgetting?"

  J. Verbal Learn. Verbal Behav., 1963, 2, 40-48.
- 11. Postman, Leo, in press association norms for four frequencies of Thorndike-Lorge words.
- 12. Roget's International Thesaurus. (New York, T.Y. Cromwell, 1962).
- 13. Sawrey, J.M., and Telford, C.W., Educational Psychology. (Boston, Allyn and Bacon, Inc., 1958).
- 14. Smith, Louis M., and Hudgins, Bryce B., <u>Educational Psychology</u>. (New York, Alfred A. Knopf, 1964) p. 359.
- 15. Thompson, G.G., Gardner, E.F., and DiVesta, I.J., Educational Psychology. (New York, Appleton Century Crofts, Inc., 1959).
- 16. Thorndike, E.L., and Lorge, I., The Teacher's Word Book of 30,000 Words. (New York, Bureau of Publications, Teachers Coll., Columbia Univ., 1944).

- 17. Travers, Robert M.H., Essentials of Learning. New York, The Mackillin Co., 1963, pp. 190-201.
- 18. Underwood, B.J., and Schulz, R.W., Meningfulness and Verbal Learning. New York, Lippincott, 1960.
- 19. Underwood, B.J., Vice-presidential address, American Association for the Advancement of Science, Berkeley, December, 1965.
- 20. Webster's Dictionary of Synonyms. Springfield, Mass., G. & C. Merriam Co., 1942.
- 21. Winer, B. J., Statistical Principles in Experimental Design.
  New York: McGraw-Hill, 1962.

453 1 44

□ 200 (1988) (1988)

<u>. 17.6</u>

Sec. 3. 3.

A STANDARD

\*\* .- .\*

Richard W. 2 Jan 1988

\$ Person Brigar

-

公表10年表

**建设** 第 55 名。

類・類 まい。タートー 数・数、ま分ませい。ター 数・数、2 24.3

#### APPENDIX

### 2006

Analysis of Variance of the Number of Correct Rasponses for Lists A and B and for List A Alone.

All Contracts	· · · · · · · · · · · · · · · · · · ·	A-I			Å-2	
High Whiteha	L	ist A & B	•		List A	
Source of Variation	13 <b>df</b> 7	Ms 1	12-24 11-22	df	12 MS	E
Between Subjects A (Stim. freq.) Subjects groups	119 1 118 17.53	• • • • • •	5.29*	59 1 58 ∂∂2°	1,303.40 193.53	6.73*
B (Pair relatishp.)  AB  B x subj. w. groups	3600° 2 2 2 236		134.54** 32.94**	300 2 2 116	1,065.91 204.55 16.40	
C (Resp. freq.) AC C x subj. w. groups	1 1 118	190.14 136.94 10.25		1 1 58	275.62 35.48 9.23	
BC ABC BC x subj. w. groups	2 2 236	476.80 73.04 12.84	37.13** 5.68*	2 ·2 116	152.57 37.39 8.14	18.74** 4.59

#### 4-3

#### Scheffe tests on subsets of means.

Comparison		<u>F</u>
HS-HR S vs. U		.44
HS-HR F vs. S + U	Ī	6.78***
HS-IR F vs. S		8.65***
HS-LR S vs. U		3.00
HS-F HR vs. LR		.01
HS-S HR vs. LR		.06
HS-U HR vs. LR		6.97***
LS-HR F ys. S	٠,	.01
LS-HR F + S vs. U		24.21**
LS-LR F vs. S		15.46**
LS-LR S vs. U		24.22**
LS-F HR Vs. LR	,	.87
IS-S PR vs. IR		9.65***
LS-U HR ve. LR		13.78*
* n C.05	₩ p €.01	*** p < .10

TABLE A-1
Number of Correct Responses in Learning.

Pair Relationship		High Re S	sponse U	Lo	Response S	<u>n</u>
High Stimulus List A + B	13.97	10.15	13.14	14.92	12-77	9.10 8.63
	在10.20.000 000 000 000 000 000 000 000 000	11.03	* 41+03* */ ×	e es <b>thes</b> ing o	10.73	
Low Stimulus List A + 3 List A	17,62 18.43	16.57 18.57	12.65 13.33	18.25 19.33	14.75 12.80	8.13 8.83

A . 34 . 18.

ी की जिल्ला

没有没有多种的 医髓膜切除

記事を表現 14 mm

がから 1. 19g をみ

がない よみなべ

# AP PENDIX

## Lists

LIST B

LIST A

Relief F 4 A 84 Judgment S 1 A A Arrange F 2 A A 43 Border F 1 A A Chambris S 1 A A 43 Border F 1 A A Treason S 1 1 A A 50 Weather F 2 AA A 1 1	Relief F 4 A 84 Judgment S 1 A A 1 Story F 1 A A 43 Border F 1 A A 5 Border F 1 A A A 5 Border F 1 A 5 Border F 1 A 5 Border F 1 A 6 Border F 1 A A A A 6 Border F 1 A A A 6 Border F 1 A A A A A 6 Border F 1 A A A A A 6 Border F 1 A A A A A B BORDER F 1 BOR	Relief F 4 A 84 Judgment S 1 A A 6 Story F 1	High		Assoc.	_ 💆	% Formal	Reanon se	Pair	Assoc.	TL Resp.	3 Formal
Arrange S 2 A 4 Border F 1 AA 60 Hollow S 1 AA 60 Removal U 0 AA 25 Pelaces F 3 AA 60 Removal U 0 0 AA 60	Arrange S 2 A 43 Border F 1 A 42 Booter F 1 A 43 Border F 1 A 44 Booter F 1 A 45 Border F 2 A 45 Border F 2 A 45 Botton F 3 L5 B6 Knowledge S 4 Bassage F 7 B 4 Bassage F 7 B 4 Bassage F 7 B 4 Bassage F 7 Bassage F 7 Bassage F 7 B 4 Bassage F 7 B 4 Bassage F 7 B 4 B 5 B 6 B 6 B 6 B 6 B 6 B 6 B 6 B 6 B 6	Arrange S 2 A 43 Border F 1 AA 60 Renown S 1 Treason F 3 15 AA 60 Renown S 1 Treason F 3 15 AA 17 Research F 1 1 29 Westler F 2 2 AA 17 Research F 1 1 29 Westler F 2 2 AA 17 Research F 1 1 20 Renowledge S 4 Renowledge S 4 Renowledge S 4 Renowledge S 1 1 1 2 0 Garette F 1 1 1 AA 25 Children U 0 AA 25 Children U 0 AA 25 Children U 0 1 1 20 Nomad U 0 1 1 20 Renowledge S 1 1 AA 25 Renowledge S 1 1 AA 30 Rorecast F 3 AA 60 Forecast F 3 1 AA 60 Forecast F 3 1 Labor F 2 2 1 Labor F 2 1 Labor F 2 2 1 Labor F 2 1 Labor F 2 2 2 1 Signal F 1 1 A 20 Winsteld S 1 1 AA 29 Renowledge S 1 1 AA 29 Renowledge S 1 1 AA 29 Renowledge S 1 1 Singatus F 2 2 2 2 2 1 Signal F 1 1 A 20 Winsteld S 1 1 Singatus F 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2		is.			9/.	Tard oman t	n	-4		
Steramon   P   1	Story     AA   60   Remove   Story     1   AA   60   Remove   50   1   1   29   Remove   50   1   29   Remove   50   1   29   Remove   50   1   29   Remove   50   20   20   20   20   20   20   20	Story     1		n ti	<b>5</b> 4	<b>⊳ 3</b>	ا در	Rorder	খ (	۽ جسر	▶ :	
Chambos S 1 1 1 29 Weather P 2 A A 15 86 Knowledge S 4 A A 17 Massage F 7 80 Garette S 1 1 1 20 AA 17 Massage F 7 80 Garette S 1 1 1 20 Massage F 7 80 Garette S 1 1 1 20 Centaux U 0 1 1 20 Momad U 0 1 20 Momad U 0 0 1 2 15 Labor F 8 1 A 60 Forecast S 1 1 A 6	Chambis   S   1   1   29   Weather   P   2	Chambols S 1 1 29 Weather F 2 2 AA 17 Massage F 7 1 80 Gazette F 1 7 80 Gazette F 1 1 1 29 Weather F 2 2 AA 17 Massage F 7 80 Gazette F 1 1 1 1 20 Capter F 2 2 1 1 1 20 Capter F 2 2 2 1 1 1 20 Capter F 2 2 2 1 1 1 20 Capter F 2 2 2 1 1 1 20 Capter F 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	* / * - * -	<b>ಷ</b> (	⊶ \$	<b>*</b>	60	Renown	(A)	<b>}ce</b> (	16	
Treason   F   3   15   86   Knowledge   S   4	Treason F 3	Treason   F   3   15   86   Knowledge   5   4   6   6   6   6   6   6   6   6   6			jus (	<b>-</b>	<u>29</u>	Weather	<b>12</b> 3	2	AA	
Section   Sect	Actice   S   2   AA   17   Massage   F   7	Application   F   1   7   8   8   8   7   7   8   8   8   8		না গ	۔ ب	15	<b>86</b>	Knowledge	တ	4	AA	
Caper Hearts       F       1       7       80       Gazette S       1         He Anguish       S       1       12       0       Turtle W       1         Human       U       0       AA       25       Children       U       0         Human       U       0       A       20       Centaur       U       0       1         Human       U       0       1       20       Nomad       U       0       1         Import       U       0       1       A       20       Nomad       U       0       1         Import       F       1       A       80       Hollow       S       1       A       1       1       1       0       0       1       1       1       0	Caper     1   7   80   Carette   S   1   12   0   Children   W   1   12   Children   W   0   0   1   20   Nomad   W   0   1   20   Nomad   W   0   0   0   0   0   0   0   0   0	Caper     1   7   80   Gazette   5   1   12   12   13   14   14   15   15   14   15   15   15	00 10	<b>6</b>	<b>N</b>	AA	17	Massage	শ্ব	7	ພ	
Incompany   1	Ingot	Internal	31	<b>*</b>	<b></b>	7	80	Gazette	S	<b>j-c</b> ò	jus	
Escape   U	History   U   O   AA   25   Children   U   O	Human   U   O   AA   25   Children   U   O   AA   26   Centaur   U   O   AA   27   Centaur   U   O   AA   27   Centaur   U   O   AA   AA   AA   AA   AA   AA		ຜ.	تحو	12	0	Turtle	**	فسو	<u>بر</u> 3	٠,
				₫.	•	<b>A</b>	25	Children	<b>=</b>	0	M	, `
Ingot   U   O   2   14   Promice   U   O	Ingot   U   O   2   14   Promice   U   O	Ingot: U		<b>c</b> i :	0	A	20	Centaur	<b>c</b>	<b>o</b>	N	,
Ingot   U   O   1   20   Nomad   U   O	Ingot   U   O   I   20   Nomad   U   O	Ingot   U   O   1   20   Nomed   U   O		더 (	• •	<b>1</b>	14	Promice	<b>=</b>	0	AA	
Cabin       F       1       A       80       Hollow       S       1         Innounce       S       1       A       25       Palace       F       3         Innounce       S       1       A       25       Palace       F       3         Innounce       F       3       AA       60       Porecast       S       1         Innounce       F       2       2       2       2       Palace       F       3         Innounce       F       3       AA       60       Porecast       S       1         Innounce       F       2       2       2       2       2       1         Innounce       F       3       AA       60       Porecast       S       1         Innounce       F       2       2       3       4       4       4       4         Innounce       F       2       3       4	Cabin     F     1     A     80     Hollow     S     1       Innounce     S     1     A     25     Palace     F     3       Innounce     S     1     A     25     Palace     F     3       Innounce     S     1     A     60     Forecast     S     1       Innounce     S     2     2     15     Labor     F     3       Innounce     S     2     2     15     Labor     F     8       Innounce     F     2     7     75     Wagon     S     1       Cambine     F     2     7     75     Wagon     S     9       Deluge     F     6     16     84     Thistle     S     1       Innounce     F     1     3     4     4     4     4       Innounce     F     1     4     4     4     4     4       Innounce     F     1     4     4     4     4     4     4       Innounce     F     1     4     4     4     4     4     4     4       Innounce     F     1     4     4     4	Cabin       F       1       A       80       Hollow       S       1         Innounce       S       1       A       25       Palace       F       3         Women       F       3       AA       60       Forecast       S       1         Trellin       S       2       2       2       15       Labor       F       3         Dory       F       2       7       75       Wagon       S       1         Teaching       S       5       AA       25       Sigma       F       1         Gamble       S       1       5       0       Kushxoom       F       2         Finges       U       0       AA       29       Knothole       U       0         Quiston       U       0       AA       29       Knothole       U       0         Rearldon       U       0       2       29       Heilstone       U       0         Rearldon       U       0       2       29       Heilstone       U       0		٦	0	<b>1-4</b>	20	Nomad	<b>u</b>	0	<b>N</b>	. ~
Cabin   F   1	Cabin   F	Cabin F 1 A 80 Hollow S 1 Cambin F 3 AA 60 Palace F 3 Trellis S 2 2 15 Labor F 8 Teaching S 5 AA 25 Wagon S 9 Camble F 6 16 84 Thistle S 1 Cambin U 0 AA 29 Knothole U 0 Cambin U 0 2 29 Hailstone U 0			-	•				-		,
Cabin F 1 A 80 Hollow S 1 Removerer S 1 A 25 Palace F 3 Trellis S 2 2 15 Forecast S 1 Treating F 2 7 75 Wagon S 9 Treating S 5 AA 25 Sigma F 1 Treating S 1 5 AA 25 Sigma F 1 Treating S 1 5 AA 25 Sigma F 1 Thistle S 1 5 AA 25 Sigma F 1 Thistle S 1 5 AA 25 Sigma F 1 Thistle S 1 5 AA 25 Sigma F 1 Thistle S 1 5 AA 25 Sigma F 1 Thistle S 1 5 AA 29 Knothole U 0 Tallon U 0 1 0 Island U 0 Tallon U 0 2 29 Heilstone U 0	Cabin   F   1	Cabin   F   1	Eca mulus	<b>\.</b>								
	Palace   Packet   P	Palace   F   3   AA   60   Forecast   S   1   1   1   1   1   1   1   1   1		<b>'</b> *3	, <b></b>	>	80	Hollow	တ	ا جنا	<b>&gt;</b>	
Freilis S 2 2 15 Labor F 8 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Homen   F   3   AA   60   Forecast   S   1	Women   F   3   AA   60   Forecast   S   1	acard finnounc	ທ	ا-قسو	<b>&gt;</b>	25	Palace	শ্ব	ω	<b>&gt;</b>	; ,
Trellis S 2 2 1.5 Labor F 8 1 Dory F 2 7 75 Wagon S 9 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Treplies   S   2   2   15   Labor   F   8	Trelits S 2 2 2 15	Homen	<b>**</b> 3	w	AA	<u>6</u> 0	Forecast	S	gust	σ	
Teaching S 5 AA 25 Sigma F 1  Teaching S 5 AA 25 Sigma F 1  Thistle F 6 16 84 Thistle S 1  Thiste S 1 5 AA 0 Wishroom F 2  Thister U 0 AA 0 Visit U 0  AA 29 Knothole U 0  Tearlfor U 0 2 29 Heilstone U 0	Dory F 2 7 75 Wagon S 9 Le Gauble F 6 16 84 Thistle S 1 Einges U 0 AA 0 Visit U 0 Quibble U 0 1 0 1 0 Island U 0 Earldon U 0 2 29 Hailstone U 0	Teaching S 5 AA 25 Sigma F 1  Teaching S 5 AA 25 Sigma F 1  On Delude S 1 5 0 Kushxoom F 2  Finger U 0 AA 0 Visit U 0  Quarter U 0 AA 29 Knothole U 0  Earldom U 0 2 29 Heilstone U 0		S	<b>~</b>	N	15	Labor	뻼	<b>&amp;</b>	AA	. ÷ .
Teaching S 5 AA 25 Sigma F 1 Le Gamble F 6 16 84 Thistle S 1 Delude S 1 5 0 Kushroom F 2 III O AA 0 Visit U 0 Quibble U 0 1 0 Island U 0 Earldon U 0 2 29 Hailstone U 0	Teaching S 5 AA 25 Sigma F 1  Jee Gamble F 6 16 84 Thistle S 1  on Delude S 1 5 0 Kushroom F 2  Finger U 0 AA 0 Visit U 0  Quibble U 0 1 0 Island U 0  Earldon U 0 2 29 Hailstone U 0	Teaching S 5 AA 25 Sigma F 1 Gamble F 6 16 84 Thistle S 1 1 5 0 Kushxoom F 2 1		শ্ব	N	7	75	Wagon	တ	10	<b>&gt;</b>	
Camble F 6 16 84 Thistle S 1  on Delude S 1 5 0 Kushxoom F 2  Finger U 0 AA 0 Visit U 0  AA 29 Knothole U 0  outbile U 0 1 0 Island U 0  Earldon U 0 2 29 Hailstone U 0	ide Gamble F 6 16 84 Thistle S 1  Delude S 1 5 0 Kushroom F 2  Finger U 0 AA 0 Visit U 0  Quarter U 0 AA 29 Knothole U 0  et Barldom U 0 2 29 Heilstone U 0	ide Gamble F 6 16 84 Thistle S 1 Delude S 1 5 0 Kushroom F 2  Winger U 0 AA 0 Visit U 0 Quibble U 0 1 0 Island U 0 et Rarldom U 0 2 29 Heilstone U 0		Ŝ	Ţ.	AA	25	Sigma	tag	هسو	3/18 m	بدر نیز
Pinger U O AA 0 Visit U O Quibble U O 1 0 Island U O 2 29 Hailstone U O	Tingen U O AA O Visit U O Quarter U O AA 29 Knothole U O Quibble U O 1 O Island U O 2 29 Heilstone U O	n Delude S 1 5 0 Kushkoom F 2 2 19 0 AA 0 Visit U 0 Quarter U 0 AA 29 Knothole U 0 Quibble U 0 1 0 Island U 0 0 2 29 Hailstone U 0 0	0	শ্ব	O.	. 16	84	Thistle	め	مبو ۽	<b>(</b>	
Pinger U O AA 29 Knothole U O 1 Quibble U O 1 0 Island U O 1 Rarldom U O 2 29 Heilstone U O 1	Quarter U O AA 0 Visit U O AA 29 Knothole U O 1 Quibble U O 1 0 Island U O 1 Earldon U O 2 29 Heilstone U O 1	Pinses U O AA O Visit U O Quarter U O AA 29 Knothole U O 1 O Island U O 2 29 Hailstone U O 1		ώ	<b>5—7</b>	(r	•	Kushroom	' <b>ন্</b>	Ņ	10	;'
Quarter U 0 AA 29 Knothole U 0 1 0 Island U 0 2 29 Heilstone U	Quarter U 0 AA 29 Knothole U 0 1 0 Island U 0 2 29 Hallstone U	Quarter U 0 AA 29 Knothole U 0 1 0 Island U 0 2 29 Heilstone U U		. : = '	0	AA	0	Visit	<b>a</b>	0	8	-
Quibble U 0 1 0 Island U Earldon U 0 2 29 Heilstone U	Quibble U 0 1 0 Island U 0 0 2 29 Hailstone U	Quibble U 0 1 0 Island U 0 2 29 Hallstone U	e E	ď	0	A	29	Knothole	Œ	9	<b>9-4</b>	 Y
Earldom U 0 2 29 Heilstone U	Earldom U 0 2 29 Heilstone U	Earldon U 0 2 29 Hailstone U	0	<b>a</b> (	0	<b></b>	<b>6</b>	Island	4	0	A	Ž
				'ä	0	8	29	Hai latone	€	0	; <b>juš</b>	. •
				٠.								
2、 大学の関係のでは、 かんかく アイ・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・										v	,	. ,
								•	-		# ·	•